Environmental Impact Analysis Process

Final
Environmental Assessment

U.S. Air Force
Advanced Extremely High Frequency
Satellite Program
(AEHF)

February 15, 2001

DEPARTMENT OF THE AIR FORCE
Space and Missile Systems Center, LAAFB, CA

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FONSI

FINDING OF NO SIGNIFICANT IMPACT
ADVANCED EXTREMELY HIGH FREQUENCY SATELLITE

Agency: Space and Missile Systems Center (SMC), LAAFB, CA

Background: Pursuant to the Council on Environmental Quality (CEQ) regulations, the provisions of the National Environmental Policy Act of 1969 (NEPA) (40 Code of Federal Regulation Parts (CFR) 1500-1508), and Air Force Instruction (AFI) 32-7061 as promulgated by 32 CFR 989, the U.S. Air Force has conducted an assessment of the potential environmental consequences of the implementation of the Advanced Extremely High Frequency (AEHF) satellite program. The purpose of the Proposed Action is to provide secure, survivable communications to the US warfighters. The Environmental Assessment (EA) considers all potential impacts of the Proposed Action and the No Action Alternative, both as solitary actions and in conjunction with other activities. This Finding of No Significant Impact (FONSI) summarizes the results of the evaluations of the proposed AEHF satellite system. The discussion focuses on activities that have the potential to change both the natural and human environments.

Proposed Action and No Action Alternative: The EA, which is hereby incorporated by reference, assesses the environmental impacts of the development, manufacturing, transportation, processing and launch activities at Cape Canaveral Air Force Station. Ground communications for the AEHF satellite are to be performed at Schriever Air Force Base and have been previously addressed in the *Milstar I and II Satellite Vehicle EA, USAF, January 1994.*

The potential environmental effects associated with the Proposed Action and No Action Alternative were assessed for the following environmental resources: air quality; wastes, hazardous materials, and stored fuels; health and safety; transportation; environmental justice and space debris re-entry.

Resources not assessed in the AEHF Satellite EA included cultural resources, biological resources, air space, water resources, geology and soils, and land use. These resources were previously assessed in the *Milstar I and II Satellite Vehicle EA, USAF, 1994; the Evolved Expandable Launch Vehicle (EELV) Final EIS, USAF, 1998; and the EELV Supplemental EIS, USAF, 2000.*

The AEHF system is needed to satisfy military communications requirements that are beyond the capabilities of the existing Milstar system such as connectivity across the spectrum of mission types that include special operations, tactical operations, and strategic defense. The AEHF system would be the protected backbone of Department of Defense (DoD) Military Satellite Communications (MILSATCOM) architecture. This new system would greatly increase both the available single user data rate and total satellite capacity while maintaining the essential features of Milstar II, namely nuclear survivability, robust anti-jam performance, low probability of intercept/detection capabilities, and worldwide

access and interoperability. The AEHF system would provide essential, survivable, anti-jam communication services for the National Command Authorities (NCA) and Commanders in Chief (CINC) to command and control their strategic and tactical forces in all levels of conflict including nuclear war.

Under the No Action Alternative, the Air Force would not go forward with the AEHF Satellite program. The warfighter and other users would continue to rely on the existing technology and capabilities of Milstar I and II which would be inadequate to meet future mission needs.

Air Quality: Air emissions estimated for the processing, launch, and operation of the AEHF satellite would not adversely affect regional air quality. As long as the Florida Department of Environmental Protection (FDEP) permit operating parameters are adhered to, no significant ambient air quality impacts or exceedances are expected.

Waste, Hazardous Materials, and Stored Fuels: Hazardous materials, wastes, and stored fuel will be managed in accordance with applicable Federal and State regulations, and installation guidelines. There is a potential for propellant spills or mishaps during processing, transfer, and launch operations. *Any spills or mishaps will be handled pursuant to all applicable state and federal laws resulting in no significant impact to environment.* However, no impacts from hazardous or solid wastes, hazardous materials, or stored fuels are anticipated to occur during the implementation of the preferred alternative.

Health and Safety: Range Safety Requirements at CCAFS address all aspects of range safety, and establish the framework within which safety issues are addressed. With the use of these and other safety measures required by the 45th Space Wing, no adverse health and safety impacts are expected.

Transportation Systems: There would be no permanent increase in traffic that would impact the installation transportation system. Impacts from the temporary increase of employees during launch operations would not result in significant impacts.

Environmental Justice: The majority of the environmental impacts of the Proposed Action would occur within the boundary of the CCAFS and would not have an impact on low-income or minority populations. As the processing and launch of the AEHF satellite would occur only six times between 2004 and 2009, and would not constitute a disproportionate impact to low income or minority populations in Brevard County, there would be no environmental justice impacts associated with the Proposed Action.

Space Debris Reentry: Orbital debris will be minimized through implementation of Air Force Space Command (AFSPACECOM) Regulation 57-2 (July 1991) requiring analysis, minimization, and mitigation of orbital debris. During launch and orbit, mitigation measures have been developed to minimize orbiting and deorbiting debris; therefore, no significant impacts are anticipated.

Unavoidable Adverse Impacts: There are no adverse impacts associated with the implementation of the preferred alternative.

Relationship Between Short-term Uses and Enhancement of Long-term Productivity: Implementation of the Proposed Action would have a positive effect on long-term productivity by providing the DoD with a secure, survivable communications system (SATCOM) to the US warfighters.

Irreversible and Irretrievable Commitment of Resources: Under the Proposed Action, fuels, manpower, and costs related to transportation, processing, and operation of the AEHF satellite will be irreversibly lost.

FINDING OF NO SIGNIFICANT IMPACT: Based upon my review of the facts and analyses contained in the attached Environmental Analysis, I conclude that implementation of the Proposed Action will not have a significant environmental impact, either by itself or cumulatively with other projects. Accordingly, the requirements of NEPA, the regulations promulgated by the Council on Environmental Quality and 32 CFR 989 are fulfilled and an Environmental Impact Statement (EIS) is not required. An availability notice for public review was published in the Daily Breeze, a local newspaper in Torrance, CA and in FLORIDA TODAY, a newspaper covering the State of Florida on February 27, 2001 for a 30 day review period which ended on March 29,2001. No comments were received. Copies of the EA and Draft FONSI were placed in the Public Library in El Segundo, CA and the Brevard County Library in Cocoa Beach, FL. The EA and FONSI also appeared on the Space and Missile Systems Center web site at http://ax.laafb.af.mil/axf/ and will be updated with the final document. A hard copy of the EA and FONSI will also be kept on file in the AEHF Program Office. The Point of Contact (POC) for requests for information is Mr.Theodore A. Krawczyk. He may be reached at (310 363-2419. The signing of this Finding of No Significant Impact (FONSI) completes the Air Force's Environmental Impact Analysis Process (EIAP).

William M. Wilson

WILLIAM M. WILSON

Brigadier General, USAF

Vice Commander

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PURPOSE OF AND NEED FOR ACTION

1.1 BACKGROUND

The United States Air Force (USAF) currently operates the Milstar satellite system to provide Military Satellite Communication Systems (MILSATCOM) to compliment the Air Force's Satellite Communication System, Navy's Fleet Satellite Communication System, and the Defense Satellite Communication System. Milstar utilizes integrated defense communications controlled from a small, continental United States-based force structure. The Milstar I System was designed as an advanced communications network consisting of three primary elements: a constellation of six satellites, a satellite ground control system, and individual user terminals. Initially conceived in 1983, this system was designed to meet the joint service requirements to simultaneously provide: (1) the tactical forces with critical command and control communications, (2) the National Command Authorities (NCA) with Single Integrated Operation Plan (SIOP) execution and (3) the Strategic Forces with direction and reportback capability. To meet user requirements, the satellite and terminal communication elements of the Milstar system were designed with a Low Data Rate (LDR) capability.

In response to additional user requirements and as outlined in the National Defense Authorization Act for fiscal year FY- 91, the original Milstar system was modified to provide additional tactical user utility, reduce overall program costs and delete heroic survivability measures. In addition, the system design was changed to provide high capacity communication links between mobile subscriber equipment communications, disseminate imagery and targeting updates, and pass atmospheric, space missile warning information to correlation centers and deployed tactical forces. To meet these expanded requirements, satellites 3 through 6 (Milstar II) were re-designed to include a Medium Data Rate (MDR) capability in addition to the LDR capability. As part of the Milstar system design modifications, the satellite ground control system was upgraded to provide enhanced control capabilities.

In 1990, Congress determined that the existing Milstar I & II satellites do not meet all of the Congressional requirements, and directed the Milstar Program to increase tactical utility of the system. In 1993, it was determined that the number of Milstar I & II satellites would be limited to six, and subsequent replenishments would have a new satellite design. This new design would take advantage of advances in technology to reduce weight and cost, and improve performance.

Presently, the first two Milstar satellites (LDR only) are operational. The third satellite, the first Milstar II satellite (LDR/MDR), was launched in April 1999 but was lost due to an upper stage booster failure. The fourth Milstar II satellite is scheduled for launch in February/March 2001, satellite 5 in January 2002, and satellite 6 in November 2002.

To meet the increasing need for high capacity, survivable satellite communications systems, the Advanced Extremely High Frequency (AEHF) satellite has been authorized by the USAF. The AEHF satellite will incorporate the National Defense Authorization Act initiatives and provide the USAF with enhanced military satellite communications capabilities.

1.2 PROPOSED ACTION

The Proposed Action is to develop, manufacture, transport , process, launch, and operate the AEHF satellite system. A total of six AEHF satellites would be launched from Cape Canaveral Air Force Station (CCAFS) using the Evolved Expendable Launch Vehicle (EELV). Command and control of the AEHF satellites would be provided from an existing fixed facility located at Schriever Air Force Base (AFB), Colorado. In addition to the fixed ground control stations, three existing US based mobile control stations would be used to communicate with the AEHF satellite constellation.

1.3 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to provide secure, survivable communications to the US warfighters. The AEHF system is needed to satisfy military communications requirements that are beyond the capabilities of the existing Milstar system such as connectivity across the spectrum of mission types that include special operations, tactical operations, and strategic defense. The AEHF system would be the protected backbone of Department of Defense (DoD) Military Satellite Communications (MILSATCOM) architecture. This new system would greatly increase both the available single user data rate and total satellite capacity while maintaining the essential features of Milstar II, namely nuclear survivability, robust anti-jam performance, low probability of intercept/detection capabilities, and worldwide access and interoperability. The AEHF system would provide essential, survivable, anti-jam communication services for the NCA and Commanders in Chief (CINC) to command and control their strategic and tactical forces in all levels of conflict including nuclear war.

1.4 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Air Force would not go forward with the AEHF satellite program. The warfighter and other users would be forced to continue to rely on limited existing technology and capabilities of Milstar I and II to try to meet future mission needs.

1.5 SCOPE OF THE ENVIRONMENTAL ANALYSIS

Federal agencies that fund, support, permit, or implement major programs and activities are required to take into consideration the environmental consequences of proposed actions in the decision-making process under the National Environmental Policy Act (NEPA) of 1969, Title 42, United States Code (USC), Section 4321, et seq. (42 USC 4321 et seq.). The intent of NEPA is to protect, restore, or enhance the environment

through well-informed federal decisions. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee federal policy in this process. The CEQ issued regulations implementing the process in Title 40, Code of Federal Regulations (CFR), Parts 1500-1508 (40 CFR 1500-1508). The CEQ regulations require that an Environmental Assessment (EA):

- Briefly provide evidence and analysis to determine whether the Proposed Action might have significant effects that would require preparation of an Environmental Impact Statement (EIS). If the analysis determines that the environmental effects would not be significant, a Finding of No Significant Impact (FONSI) would be prepared for the approval of the decision maker.
- Facilitate the preparation of an EIS, when required.

This EA provides the basis for a determination of the degree of the environmental impacts of the Proposed Action. The EA is part of the Environmental Impact Analysis Process (EIAP) for the proposed project as set forth in Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*, as promulgated in 32 CFR 989 which implements NEPA, CEQ regulations, DoD Instruction 4715.9, *Environmental Planning and Analysis*, and Air Force Policy Directive (AFPD) 32-70, *Environmental Quality*.

The EA, *Milstar I and II Satellite Vehicle*, dated January 1994 (U.S. Air Force Space and Missile Systems Center), assessed the environmental impacts of development and operation of the Milstar I and II Satellite Vehicles and launch from CCAFS using the Titan IV launch vehicle. Many pre-launch, processing, and launch pad activities required for the AEHF satellite were evaluated in the Milstar EA. AEHF satellites would be launched using EELVs, Environmental impacts resulting from launch activities associated with the EELV system have been assessed in the *EELV Final Environmental Impact Statement*, dated April 1998 (U.S. Air Force Space and Missile Systems Center), and the *EELV Supplemental Environmental Impact Statement*, dated April 2000 (U.S. Air Force Space and Missile Systems Center). This EA then analyzes AEHF satellite development, manufacture, transport, processing, launch requirements, and incorporates by reference, as appropriate, pertinent information from the EELV FEIS and the Milstar I and II EA.

This EA identifies, describes, and evaluates the potential environmental impacts that could result from the implementation of the Proposed Action and No Action Alternative, and includes possible cumulative impacts from all reasonably foreseeable activities. It also identifies required environmental permits relevant to the Proposed Action. As appropriate, the affected environment and environmental consequences of the Proposed Action may be described in terms of regional overview or site-specific descriptions. Finally, the EA identifies measures to prevent or minimize environmental impacts.

1.5.1 Resources Not Analyzed in this EA

The following table summarizes all environmental resources that were eliminated from the EA, see Table 1.6-1.

Table 1.5-1 Resources Eliminated From EA

Resource	**Reason Eliminated from Analysis**
Cultural Resources	Based on the Cultural Resource Management Plan Volume I, 1996, and information provided by the ESC, CCAFS does not have any cultural or archeological sites within or adjacent to the Proposed Action site boundaries. Also, culturally significant buildings/sites would not be altered or disturbed as a result of the Proposed Action. Therefore, no impacts to cultural resources are expected and they are not analyzed in this EA.
Noise	Noise analyses resulting from the launch of the EELV have been evaluated and documented in the EELV SEIS dated April 2000. The noise impacts associated with the processing of the AEHF satellites would not be significant because of the relative isolation of CCAFS to adjacent communities.
Land Use	No changes to land use would occur as a result of the Proposed Action. Under the Proposed Action, facility utilization would be consistent with the existing land use designation at CCAFS. No new facilities are required at Schriever AFB, CO for AEHF ground communications.
Biological Resources*	Biological impacts resulting from the launch of the satellites have been assessed in the *EELV Final Environmental Impact Statement*, dated April 1998 (U.S. Air Force Space and Missile Systems Center), and the *EELV Supplemental Environmental Impact Statement*, dated April 2000 (U.S. Air Force Space and Missile Systems Center). Biological impacts resulting from the processing and operation of satellites have been assessed in the *Milstar I and II Satellite Vehicle Environmental Assessment*, dated January 1994 (US Air Force Space and Missile Systems Center). Total fuel quantities with the AEHF satellite increased approximately 1.0% compared to the total fuel quantity analyzed in the *EELV Final Environmental Impact Statement* and the *EELV Supplemental Environmental Impact Statement.* This increase was considered insignificant and would not result in additional biological impacts. Therefore, biological impacts are not analyzed in this EA.

Table 1.5-1 Resources Eliminated From EA (continued)

Resource	**Reason Eliminated from Analysis**
Water Resources*	The Proposed Action will utilize existing facilities on CCAFS No impacts would result from the processing, launch, and operation of the AEHF satellite. Water Resources are assessed in the *EELV Final Environmental Impact Statement*, dated April 1998 (U.S. Air Force Space and Missile Systems Center), the *EELV Supplemental Environmental Impact Statement*, dated April, 2000 (U.S. Air Force Space and Missile Systems Center) and the *Milstar I and II Satellite Vehicle Environmental Assessment*, dated January 1994 (US Air Force Space and Missile Systems Center). Total fuel quantities with the AEHF satellite only increased approximately 1.0% compared to the total fuel quantity analyzed in the *EELV Final Environmental Impact Statement* and the *EELV Supplemental Environmental Impact Statement.* This increase was considered insignificant and would not result in additional impacts to the water resources of CCAFS. Therefore, water resources are not analyzed in this EA.
Geology and Soils*	No direct or indirect impacts on topography or soils would be anticipated because disturbance of soils is not anticipated. Therefore, they were not analyzed in this EA. Geology and soils are assessed in the *EELV Final Environmental Impact Statement*, dated April 1998 (U.S. Air Force Space and Missile Systems Center), the *EELV Supplemental Environmental Impact Statement*, dated April, 2000 (U.S. Air Force Space and Missile Systems Center) and the *Milstar I and II Satellite Vehicle Environmental Assessment*, dated January 1994 (US Air Force Space and Missile Systems Center).

* - In the event of a mishap impact (failure of satellite system at or near the launch pad), the facility Hazardous Management Plan would include the proper responses to accidental releases in order to minimize impacts to the populace and the environment. All fueling and launch operations would follow established procedures to minimize the potential for accidental releases.

1.5.2 Resources Analyzed in this EA

This environmental analysis focuses on the most important issues among the following environmental resources identified for study: air quality, toxic and hazardous materials and hazardous waste management, transportation, health and safety, space debris re-entry, and non-ionizing radiation.

Other environmental regulatory requirements relevant to the Proposed Action and alternatives also are identified in this EA. Regulatory requirements under the following

programs, among others, will be assessed: Clean Air Act (CAA), Resource Conservation and Recovery Act (RCRA); Toxic Substances Control Act (TSCA) of 1970; and Occupational Safety and Health Act. Requirements also include compliance with EO 12898, Environmental Justice.

1.6 INTRODUCTION TO THE ORGANIZATION OF THE DOCUMENT

This EA is organized into seven chapters.

Chapter 1 contains the purpose of and need for the Proposed Action; defines the site and location of the Proposed Action; presents the scope of the environmental review and the EIAP; and outlines the organization of this EA.

Chapter 2 provides introductory information relative to the Proposed Action and alternatives; gives a history on the formulation of the alternatives; briefly describes alternatives eliminated from further consideration such as design alternatives to the AEHF system; details the Proposed Action; presents the No Action Alternative; and summarizes the environmental impacts.

Chapter 3 contains a general description of the environmental resources that potentially could be affected by the Proposed Action.

Chapter 4 analyzes the environmental consequences; states any potential environmental impacts; and describes any irreversible or irretrievable commitment of resources.

Chapter 5 lists preparers of this document.

Chapter 6 lists persons and agencies consulted in the preparation of this EA.

Chapter 7 is a list of source documents relevant to the preparation of this EA.

Chapter 8 is a list of acronyms used in this EA.

SECTION 2.0

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes in detail the Proposed Action and the No Action Alternative, identifies alternatives eliminated from further consideration, identifies the preferred alternative, and provides a comparison of environmental impacts from the alternatives considered. The Proposed Action is the development, manufacture, transportation processing, launch and operation of the AEHF satellite system.

2.2 DETAILED DESCRIPTION OF THE PROPOSED ACTION

2.2.1 Location and Background

The AEHF satellite would be launched from CCAFS. CCAFS is located on Cape Canaveral in Brevard County, on Florida's Atlantic coastline near the city of Cocoa Beach. Figure 2.1 shows the general location of CCAFS, which is located on the northern portion of the barrier island. The island is bounded by the Atlantic Ocean to the east and the Banana River to the west.

Ground communications for the AEHF satellite program would be accomplished utilizing existing facilities at Schriever AFB, CO.

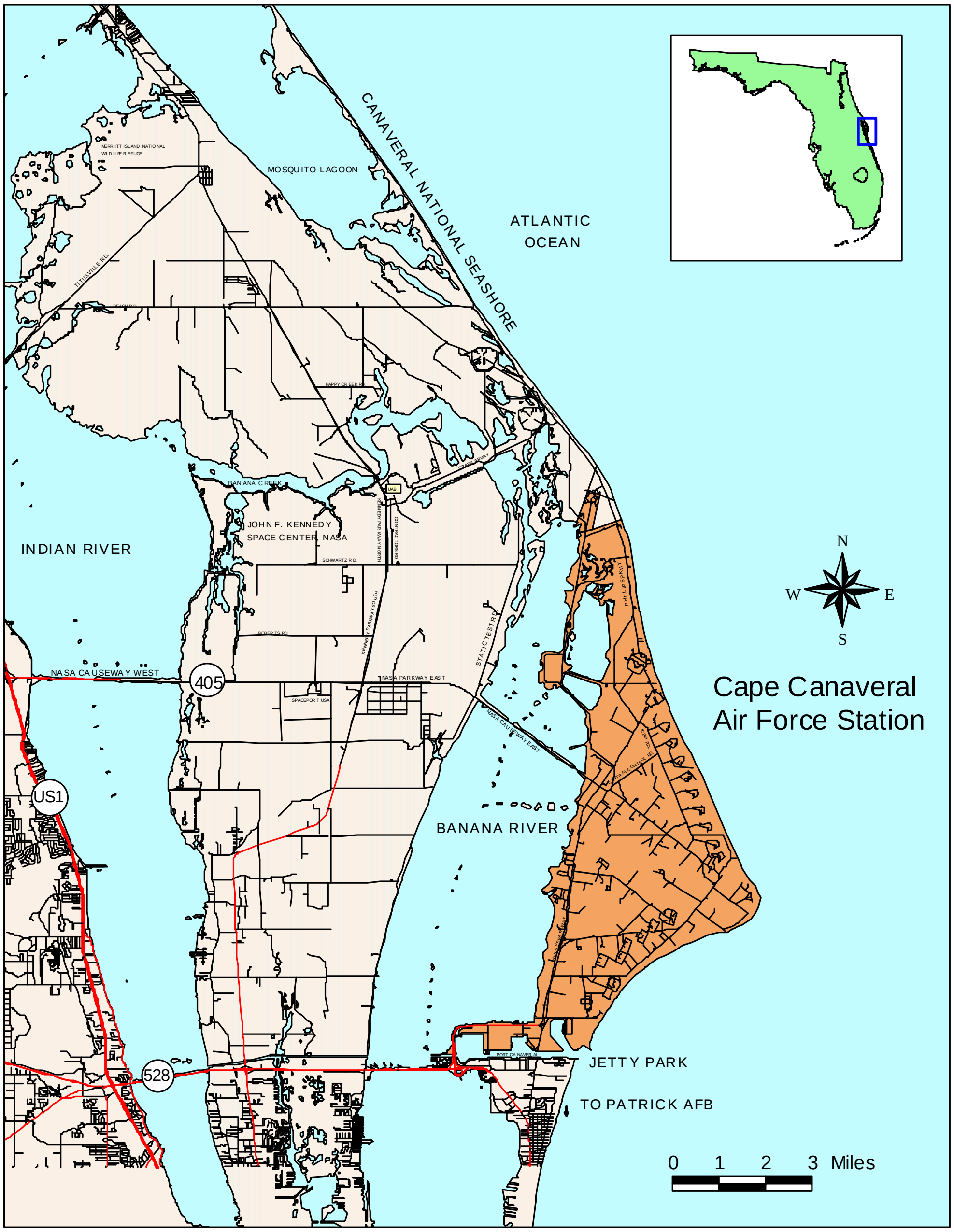


Figure 2.1 Location Map

2.2.2 AEHF Satellite

The AEHF satellite would weigh approximately 9,920 pounds at launch, including fuels for the propulsion system and solar cells for production of onboard power. Figure 2.2 illustrates the AEHF satellite in its orbital configuration. The AEHF satellite would use a dual mode propellant system for orbit maintenance and orbit transfer. In addition to

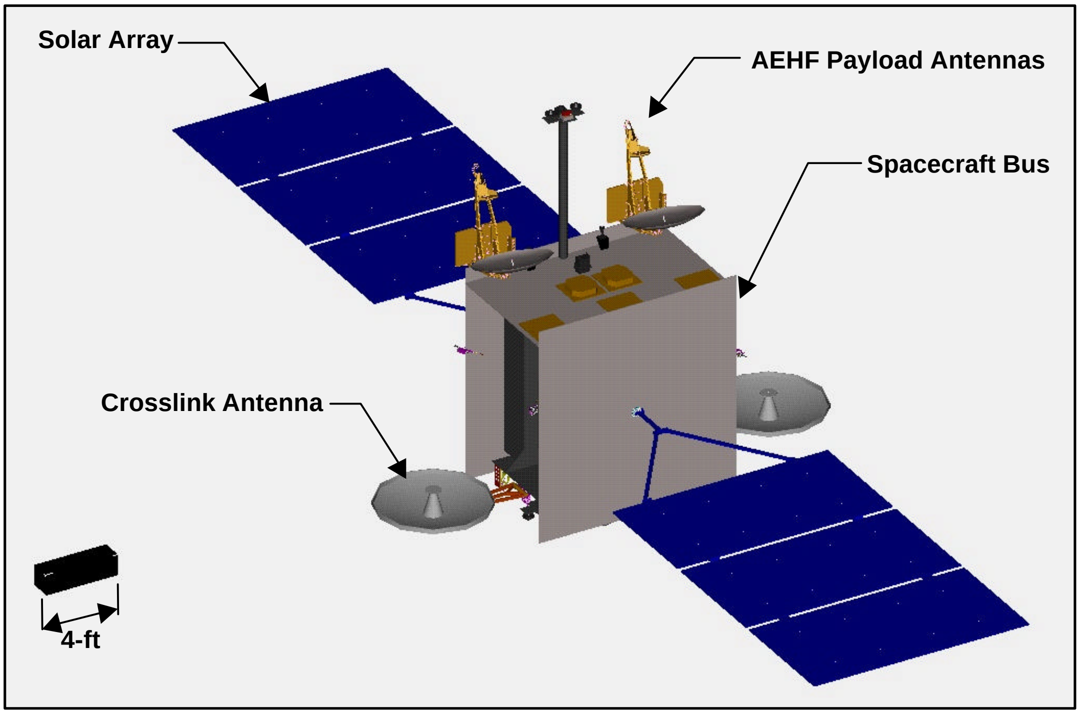


Figure 2.2: Advanced Extremely High Frequency Satellite in Orbital Configuration

liquid propellant, nitrogen tetroxide (N_2O_4) and hydrazine (N_2H_4), current design concepts also include an electric propulsion system with Xenon propellant. This system would be utilized to perform a portion of the orbit transfer requirements and for the majority of orbital stationkeeping requirements. Table 2.2-1. provides data on the estimated weights of fuel materials to be carried on the AEHF satellite.

Table 2.2-1: Type And Estimated Quantity Of Fuel Material

MATERIAL	QUANTITY
Propellant:	5,818 lb total
Nitrogen Tetroxide (N_2O_4)	2,349 lb
Hydrazine (N_2H_4)	2,764 lb
Xenon (Xe)	705 lb

Source: Lockheed Martin – Response to Environmental Impact Analysis Questionnaire (October 1999)

The onboard electrical power generation system would consist of high efficiency solar cells. Current design parameters for the AEHF satellite do not anticipate the use of either nuclear or rare metals. However, current design evaluations indicate the possible use of hazardous materials as listed in Table 2.2-2.

Table 2.2-2: Type And Quantity Of Hazardous Materials Planned For Use On The AEHF Satellite	
MATERIAL	**QUANTITY**
Lithium phosphate hexafluoride ($LiPF_6$) Cobalt (in the form of $LiCoO_2$)	1.7 Kilograms (Kgs) per battery Total/Spacecraft – 3.4 Kgs for a 2 battery set
Ni-Hydrogen Battery Potassium Hydroxide (KOH) : Battery Cells	Amt./Unit – 265 grams (Totally Absorbed) Total/Spacecraft – 13.8 Kgs
Gaseous Helium (He): Pressurant	 30.0 Lbm (4840 Cubic Inches)
EED Explosive Mixtures Potassium Perchlorate ($KClO_4$) Initiators RDX/Diphenylamine ($C_{12}H_{11}N$)/Nitro-Cellulose Booster Charges	 Amt./Unit – 114 mg Total (64) / Spacecraft – 7.3 grams Amt./Unit – 4 @325mg/4@625mg Total/Spacecraft – 3.8 grams

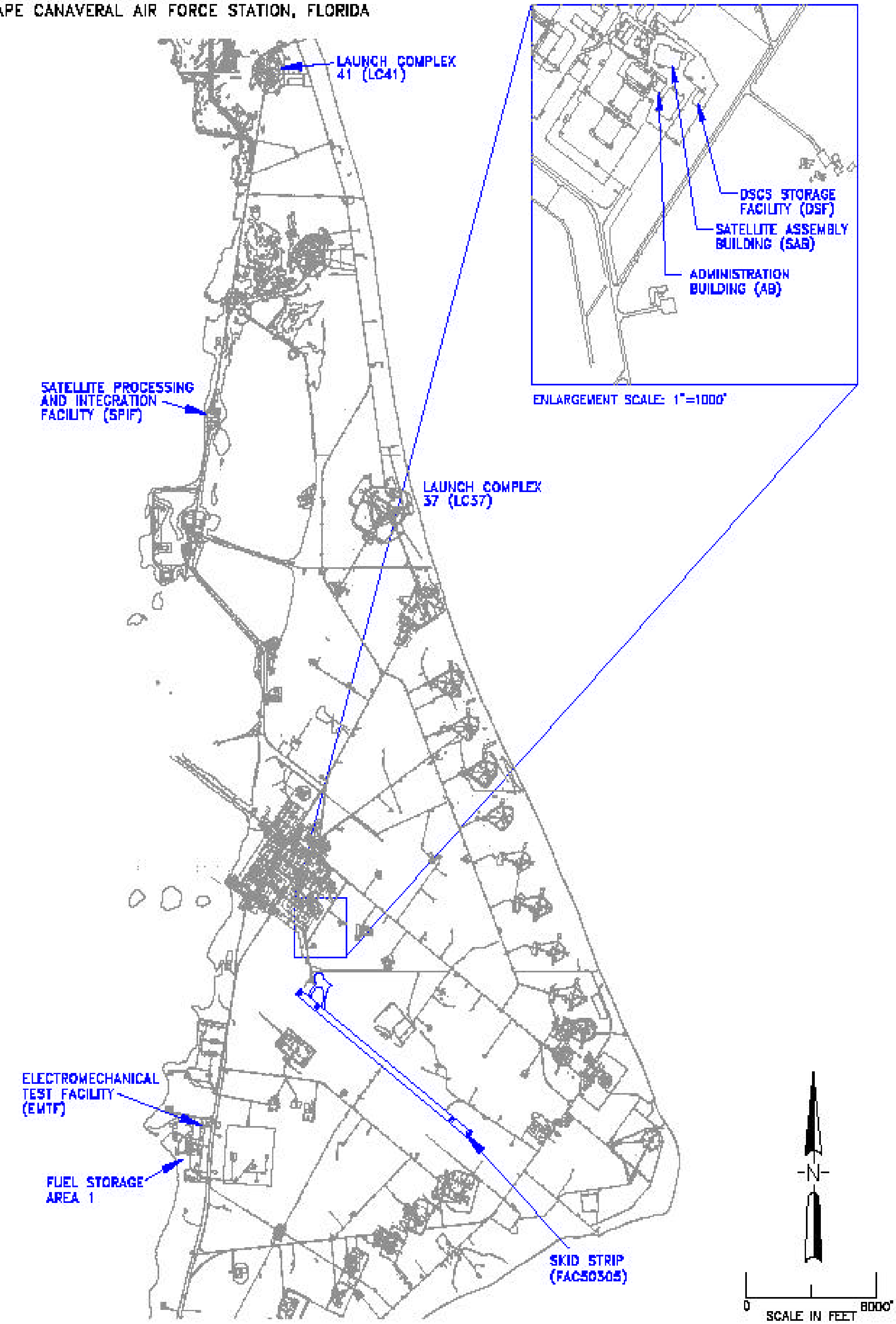
Source: Lockheed Martin – Response to Environmental Impact Analysis Questionnaire (October 1999)

2.2.3 AEHF Satellite Processing

After manufacture, AEHF satellites would be transported to CCAFS via C5A aircraft. The C5A aircraft would land at the CCAFS runway (skid strip). From the skid strip, the satellites would be transported to the satellite processing facility. Prelaunch processing of the AEHF satellite would occur onsite at the CCAFS Satellite Processing and Integration Facility (SPIF). The location of the SPIF in relation to the skid strip is shown in Figure 2.3. The AEHF SPO will prepare a transportation plan to transport satellite prior to each launch of an AEHF satellite.

The following existing facilities at CCAFS would be used in support of AEHF satellite pre-launch processing operations: the Cape Canaveral AFS runway (skid strip), SPIF, Fuel Storage Area I (FSA-1), the Electromechanical Test Facility (EMTF), Administration Building (AB), the Satellite Assembly Building (SAB), the Vehicle Checkout Facility (VCF), and the DSCS Storage Facility (DSF). Figure 2.3 shows the location of each of these facilities within CCAFS. The function of each of these areas is summarized below:

FIGURE 2.3
LOCATION OF FACILITIES WITHIN
CAPE CANAVERAL AIR FORCE STATION, FLORIDA



Skid Strip. The skid strip (Facility 50305) would be utilized by aircraft delivering manufactured satellites. It was constructed in 1952.

SPIF. The SPIF is located adjacent to the Solid Motor Assembly Building (SMAB). The facility contains a Class 100,000 clean room that would be used during processing. A Class 100,000 clean room maintains air with a particle count not to exceed 100,000 particles per cubic foot of a size 0.5 microns (μ) and larger. Figure 2.4 shows the interior configuration of the SPIF.

Fuel Storage Area 1 (FSA-1). FSA-1 would be used to store liquid propellants.

Electromechanical Test Facility (EMTF). The EMTF (Facility 1058) would be used for testing of ordnance devices.

Administration Building (AB). The AB (Facility 49901) is a modular office complex providing office space for satellite contractor personnel.

Satellite Assembly Building (SAB). The Eastern Vehicle Checkout Facility (EVCF) is housed in the SAB (Facility 49904). An antenna on the roof would communicate with the satellite to test the communications system.

Transportable Vehicle Checkout Facility (TVCF). The TVCF is a mobile resource normally situated near the SAB, with a 23-foot diameter antenna. It is used in conjunction with the EVCF to test the satellite network links with ground control facilities.

DSCS Storage Facility (DSF). The DSF (Facility 44700) would be used to store shipping container, the satellite transporter, propellant transfer equipment, and may be used for interim storage of the satellite and IABS.

Upon arrival at CCAFS, the satellites would be transported to the SPIF. At the SPIF, the satellite would be offloaded into the air lock, removed from the shipping containers, installed on individual test dollies, and transferred into one of two integration cells for inspection and processing. After the receiving inspection, a leak test of the propulsion systems would be performed. After leak testing, the AEHF satellite would be electrically connected and an integrated systems test would be performed where all subsystems are functionally tested.

Fuel for the propulsion system would be transferred into the satellite fuel tanks from a dual propellant transfer apparatus (PTAs) via a closed transfer system. The PTA is a fully contained unit for propellant transfer and is connected to the AEHF satellite via flexible transfer lines. Prior to fueling, the fuel would be stored at FSA-1 under the supervision of the Joint Propellants Contractor (JPC) who would deliver fuel to the SPIF when needed. Fuel would be transferred to the satellite from Department of Transportation (DoT) certified fuel storage containers.

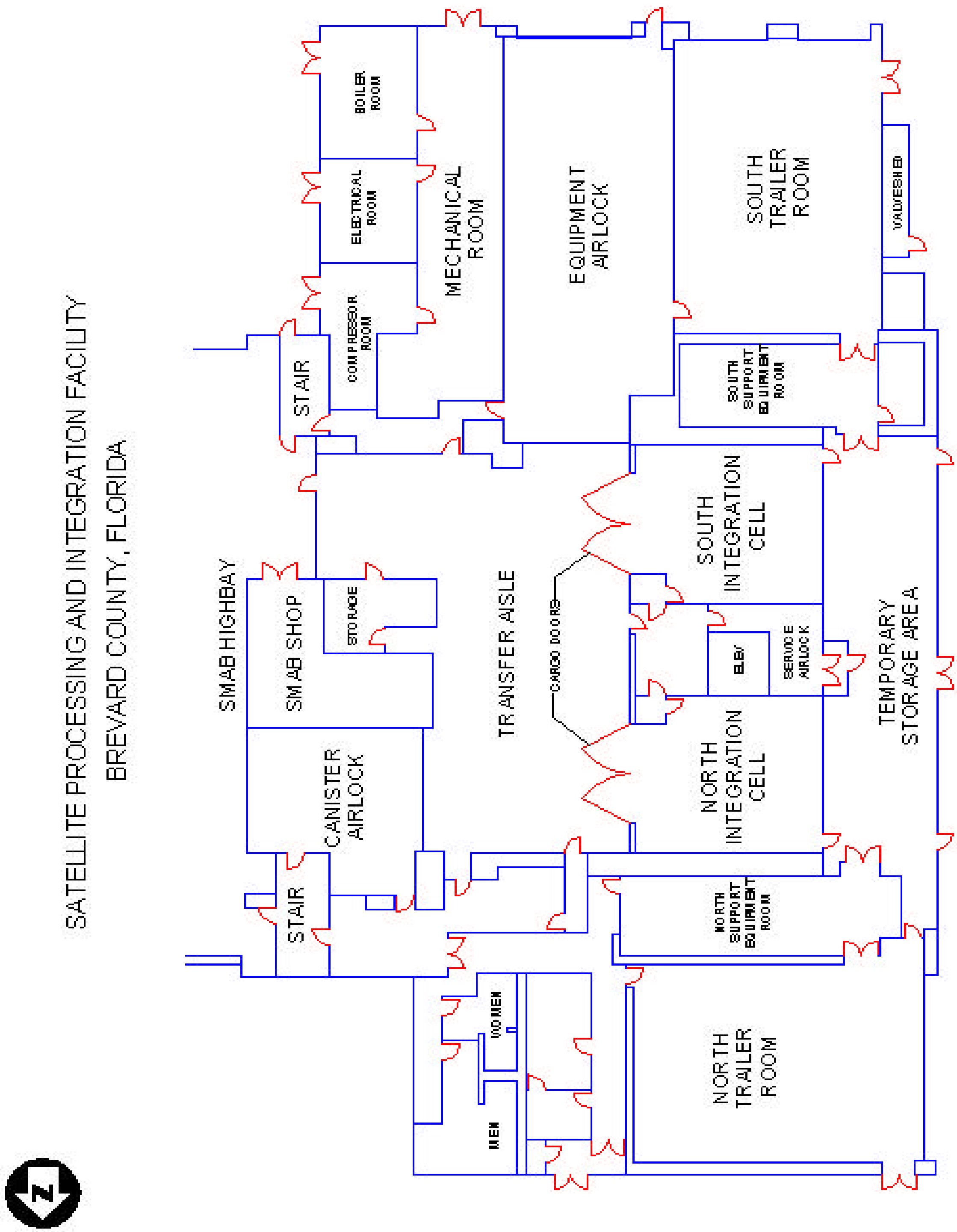


Figure 2.4 Interior Configuration of SPIF

Propellant transfer equipment and lines would be connected to the fuel storage container and the satellite fuel tanks would be evacuated, causing fuel to flow into the satellite fuel tanks. When the proper amount of fuel has been loaded, the transfer equipment and lines would be drained back into the fuel storage container. Then they would be purged and/or evacuated with gaseous nitrogen through the SPIF hypergolic vent system that is connected to a vapor scrubber. The scrubber would operate in accordance with its existing air permit. A liquid separator is included in the vent system to accumulate liquid.

Once transfer of fuel or oxidizer is complete, all lines in the transfer would be purged from the fuel/oxidizer handling systems. After all lines are purged of fuel or oxidizer, the PTA is returned to the fueling contractor for cleaning. Excess fuel or oxidizer is transferred to 55-gallon drums and transported to FSA-1. The PTA is also transported to FSA-1 where it is cleaned using three 15-gallon flushes of deionized water. This flush water is disposed of as hazardous waste. The PTA is then cleaned with three 250-gallon flushes of deionized water. Deionized water rinseate from the N_2O_4 PTA must be disposed of as hazardous waste by the JPC. Disposal of hazardous waste generated during satellite processing is discussed in Section 3.2.

After propellant loading, propellant tanks would be pressurized with helium and the AEHF satellite would be mated to the launch vehicle adapter and encapsulated in the payload fairing. The encapsulated payload is then transported to the Space Launch Complex (SLC) for mating with the EELV Vehicle).

Table 2.2-3 provides a listing of materials that would be used at CCAFS during processing of the AEHF satellite in preparation for launch.

Table 2.2-3 : Ground Processing Materials

MATERIAL
Isopropyl Alcohol (C_3H_8O)
Methyl Ethyl Keytone (MEK)
Acetone (C_3H_6O)
Epibond Epoxy Adhesive
Hysol Adhesive
RTV (Red) Adhesive
Dow Corning Clear Silicon Adhesive
Ecobond Silver Conductive Solder

Quantities of the above materials are to be determined.
Source: Lockheed Martin – Responses to Environmental Impact Analysis Questionnaire (October 1999)

2.2.4 Launch Activities

The AEHF satellite would be launched from CCAFS using a Either SLC-37 or SLC-41 to support the AEHF satellite mission (See Figure 2.3 for locations). A total of six AEHF satellites would be launched over the 5-year deployment period that ranges from FY04 through FY09.

2.2.5 Orbit Conditions

The Space Segment would consist of placing six AEHF satellites in geosynchronous low inclined orbits. The full constellation would provide worldwide connectivity from 65 degrees South latitude to 65 degrees North latitude without reliance on ground relay sites.

2.2.6 AEHF Satellite Mission Control Sites

Ground communications for the AEHF satellite would be performed from an existing fixed site at Schriever AFB, Colorado. Ground communications would also be supported from existing US based mobile command systems. No construction or modification of either buildings, support facilities or structures is required in support of the AEHF Program. Modifications of existing terminal hardware, software, and databases are required in support of the AEHF Satellite Program. Environmental impacts associated with the AEHF Satellite Ground Communication system have been previously addressed in the *Milstar I and II Satellite Vehicle EA* (USAF, 1994).

Milstar currently operates five MCCSs throughout the continental US to control the Milstar constellation. Three of these existing MCCSs would be utilized in support of the AEHF satellite system. MCCSs would provide command, control, and telemetry of the satellites, monitor and maintain the health of the satellite, manage satellite time and frequency, and manage the satellite's orbit and distributed constellation control. The MCCS consists of a shelter, operation room, and antenna storage mounted on a flatbed tractor-trailer type vehicle. When in use, the antenna is erected on the ground approximately 35 feet from the MCCS. Environmental effects of operating the Milstar MCCS have been evaluated in the *EA for the Milstar Communications System*.

2.3 COMMERCIAL ALTERNATIVE CONSIDERED

An alternative which may have to be exercised by the AEHF SPO would be to use a commercial facility such as Astrotech, Inc. in Titusville, Florida. Facilities like Astrotech are company owned, company operated (COCO) and are located off-base. Astrotech would have facilities to process satellites with 5-meter payload fairing missions by the expected launch date. As a COCO, Astrotech would be responsible for obtaining all required environmental operating permits and development of appropriate health and safety procedures prior to operation of their facility. Transportation between a COCO and the entrance gate to CCAFS is the responsibility of Astrotech and since they are privately owned facilities, they are not required to perform NEPA analysis or study.

2.4 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

The Agency preferred alternative is the Proposed Action. Implementation of the Proposed Action would result in processing and launch of AEHF satellites from CCAFS using an EELV. Results of this EA demonstrate that the incremental and cumulative impacts resulting from the Proposed Action would be negligible. Therefore, the environmentally preferred alternative is the Proposed Action.

2.5 COMPARISON OF THE ENVIRONMENTAL IMPACTS OF ALL ALTERNATIVES

Table 2.5-1 compares the environmental effects of the Proposed Action and the No Action Alternative.

Table 2.5-1 Comparison of Environmental Consequences

Environmental Resource Areas	Proposed Action	No Action Alternative
Air Quality	Short-term – No Impacts	Short-term –No Impacts
	Long-term – No Impacts	Long-term - No Impacts
Wastes, Hazardous Materials, Stored Fuel	Short-term – Minor Adverse[1]	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Health and Safety	Short-term - No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Transportation	Short-term - No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Environmental Justice	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Space Debris and Reentry	Short-term – Minor Adverse [2]	Short-term – No Impacts
	Long-term – Minor Adverse [2]	Long-term – No Impacts
Non-Ionizing Radiation	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Indirect and Cumulative Impacts	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts

Note:

1 Wastes, Hazardous Materials, and Stored Fuel - Potential short-term, temporary impacts are expected during propellant loading.

2 Space Debris and Reentry - Potential adverse impacts during launch operations (short-term impact) and during orbit or disposal orbit operations (long-term).

SECTION 3.0

AFFECTED ENVIRONMENT

3.1 AIR QUALITY AND REGULATIONS

Air quality in any given region is measured by the concentration of various pollutants in the atmosphere, typically expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is not only determined by the types and quantities of atmospheric pollutants, but also by surface topography, the size of the air basin, and by the prevailing meteorological conditions.

3.1.1 Meteorology

CCAFS is located on the east coast of Florida at approximately 28.5 degrees north latitude and 81.7 degrees west longitude. The climate at CCAFS is characterized by long, relatively hot summers and mild winters. The average temperature is 71°F with a minimum monthly average of 60°F in January and a maximum of 81°F in July. Rainfall is seasonal with a wet season occurring from May to October, while the remainder of the year is relatively dry. Average annual rainfall for CCAFS is approximately 48 inches, about 70 percent of which occurs during the wet season which occurs from May through October.

3.1.2 Air Quality Standards

The Clean Air Act (CAA) of 1970 directed the United States Environmental Protection Agency (USEPA) to develop, implement, and enforce strong environmental regulations that would ensure cleaner air for all Americans. In order to protect public health and welfare, the USEPA developed concentration-based standards called National Ambient Air Quality Standards (NAAQS). The promulgation of the CAA was driven by the failure of nearly 100 cities to meet the NAAQS for ozone and carbon monoxide, and by the inherent limitations in previous regulations to effectively deal with these and other air quality problems. The USEPA established both primary and secondary NAAQS under the provisions of the CAA. Primary standards define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary standards define levels of air quality necessary to protect public welfare (e.g., soils, vegetation, property, and wildlife) from any known or anticipated adverse effects.

NAAQS are currently established for six air pollutants (known as “criteria air pollutants”) including carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur oxides (SO_X, measured as sulfur dioxide, SO_2), lead (Pb), and particulate matter. Particulate matter standards incorporate two particulate classes: 1) particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), and 2) particulate

matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$). Only PM_{10} is regulated by the rule.

SO_2 in the atmosphere is converted to various conjugated sulfur compounds that form physically harmful vapors or micro droplets (e.g., sulfuric acid) when combined with particulate matter and water. Most SO_X compounds are irritants to the upper respiratory tract, and prolonged exposure can cause permanent lung damage. In addition, suspended SO_X compounds in the atmosphere scatter visible light resulting in a brownish haze and reduced visibility.

Although O_3 is considered one of the criteria air pollutants and is measurable in the atmosphere, it is considered a secondary pollutant since O_3 is typically not emitted directly from most emissions sources. O_3 is formed in the atmosphere by photochemical reactions involving previously emitted pollutants or ozone precursors; therefore, O_3 is not considered when calculating emissions. Ozone precursors consist primarily of nitrogen oxides (NO_X) and volatile organic compounds (VOCs) which are directly emitted from various emission sources. For this reason, an attempt is made to control O_3 through the control of NO_X and VOCs. On June 5, 1998, the USEPA issued the final rule identifying areas where the 1-hour NAAQS for ozone is no longer applicable. Under this rule, the 1-hour standard will not apply to areas in which no violation of the previous 1-hour ozone standards has occurred. However, in areas in which past violations have occurred, the 1-hour ozone standard will continue to apply.

The CAA does not make the NAAQS directly enforceable. However, the CAA does require each state to promulgate a State implementation plan (SIP) that provides for implementation, maintenance, and enforcement of the NAAQS in each air quality control region (AQCR) in the state. The CAA also allows states to adopt air quality standards that are more stringent than the Federal standards. The NAAQS are listed in Table 3.1-1.

3.1.3 Regional Air Quality

Federal actions must comply with the USEPA Final General Conformity Rule published in 40 CFR 93, subpart B (for Federal agencies) and 40 CFR 51, subpart W (for State requirements). The Final Conformity Rule, which took effect on January 31, 1994, requires all Federal agencies to ensure that proposed agency activities conform with an approved or promulgated SIP or Federal implementation plan (FIP). Conformity means compliance with a SIP or FIP for the purpose of attaining or maintaining the NAAQS. Specifically, this means ensuring the Federal activity does *not*: 1) cause a new violation of the NAAQS; 2) contribute to an increase in the frequency or severity of violations of existing NAAQS; 3) delay the timely attainment of any NAAQS; or 4) delay interim or other milestones contained in the SIP for achieving attainment.

Table 3.1-1 National and State Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Primary NAAQS[a,b,c]	Secondary NAAQS[a,b,d]
Carbon Monoxide (CO)	8-hour 1-hour	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	No standard No standard
Lead (Pb)	Quarterly	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual	0.0543 ppm (100 $\mu g/m^3$)	0.0543 ppm (100 $\mu g/m^3$)
Ozone(O_3)	1 hour[e]	0.12 ppm (235 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)
PM_{10}	Annual 24-hour	50 $\mu g/m^3$ 150 $\mu g/m^3$	50 $\mu g/m^3$ 150 $\mu g/m^3$
Sulfur Oxides (measured as SO_2)	Annual 24-hour 3-hour	0.03 ppm (80 $\mu g/m^3$) 0.14 ppm (365 $\mu g/m^3$) No standard	No standard No standard 0.50 ppm (1,300 $\mu g/m^3$)

PM_{10} Particles with aerodynamic diameters less than or equal to a nominal 10 micrometers

a The 8-hour primary and secondary ambient air quality standards are met at a monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.08ppm.

b The NAAQS are based on standard temperature and pressure of 25^0 Celsius and 760 millimeters of mercury.

c National Primary Standards: The levels of air quality necessary to protect the public health with an adequate margin of safety. Each State must attain the primary standards no later than three years after the State implementation plan is approved by the USEPA.

d National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each State must attain the secondary standards within a "reasonable time" after the State implementation plan is approved by the USEPA.

The Final General Conformity Rule *only* applies to Federal actions in designated nonattainment or maintenance areas, and the rule requires that total direct and indirect emissions of nonattainment criteria pollutants, including ozone precursors, be considered in determining conformity. The rule does not apply to actions that are not considered regionally significant and where the total direct and indirect emissions of nonattainment criteria pollutants do not equal or exceed *de minimis* threshold levels for criteria pollutants established in 40 CFR 93.153(b). A Federal action would be considered regionally significant when the total emissions from the Proposed Action equal or exceed 10 percent of the nonattainment area's emissions inventory for any criteria air pollutant. If a Federal action meets *de minimis* requirements and is *not* considered a regionally significant action, then it does not have to go through a full conformity determination. Ongoing activities currently being conducted are exempt from the rule so long as there is no increase in emissions above the *de minimis* levels as the result of the Federal action.

CCAFS is located in Brevard County within the Central Florida Intrastate AQCR 48. AQCR 48 includes the Florida Counties of Brevard, Lake, Orange, Osceola, Seminole, and Volusia. The USEPA has designated the air quality within Brevard County as better than NAAQS for TSP and SO_2, and unclassified for CO, Pb, NO2, O_3, and PM_{10}. The area is classified as Prevention of Significant Deterioration (PSD) Class II (USAF, 2000).

3.1.4 Air Emission Sources

The CCAFS Title V Air Permit regulates the operation of stationary sources of air pollution emissions at CCAFS. Potential sources of air pollution on CCAFS include rocket preparation, assembly, and fueling activities; mobile sources such as support equipment, commercial transport (including aircraft), personal vehicles, and launch emissions; and point sources such as heating units, power plants, generators, incinerators, and storage tanks. Nearby air pollution sources include two regional power plants located within 12 miles of the station (U.S. Air Force, 2000).

Exhaust from rocket motor ignition during launches is episodic in nature and does not directly contribute to the long-term air quality at CCAFS. The permitted stationary point and area emission source inventory for the AQCR 48 is presented in Table 3.1-2 for comparative purposes.

Table 3.1-2 Stationary Emissions Inventory for the Central Florida Intrastate AQCR

Air Pollutant Emission Source[a]	CO (tpy)	VOC (tpy)	NO_x (tpy)	SO_x (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 48 Emissions Inventory[a]	3,470	1,908	29,055	51,402	2,715	5.3

[a] Source: USEPA, 2000
tpy – tons per year

3.2 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

Hazardous materials and wastes are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. Sections 9601-9675), the Toxic Substances Control Act (15 U.S.C. Sections 2601-2671), and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. Sections 6901-6992). In addition, hazardous substances and hazardous chemicals are regulated by the Emergency Planning and Community Right to Know Act (EPCRA) (42 U.S.C. Sections 11001-11050). Transportation of hazardous materials is regulated by the U.S. DoT regulations within 49 CFR.

The following subsections discuss hazardous materials, hazardous waste, pollution prevention, remediation sites, storage tanks.

3.2.1 Hazardous Materials Management

Hazardous materials management is the responsibility of contractor. Contractors typically report to the EPA under SARA/EPCRA. The Joint Propellants Contractor (JPC) controls hazardous fuels for the 45th Space Wing (45 SW) and operates the fuel farm (FSA-1) on CCAFS. The JPC provides for the purchase, transport, temporary

storage, and loading of hazardous fuels and oxidizers. Spills of hazardous materials are covered under 45 SW Operational Plan 32-3, *Hazardous Materials Response Plan*. The JPC operates under the Joint Base Operation Support Contract.

3.2.2 Hazardous Waste Management

Hazardous waste management at CCAFS is regulated under 40 CFR 260-280 and Florida Administrative Code (FAC) 62-730. These regulations are implemented through 45 SW Operational Plan 19-14, *Petroleum Products and Hazardous Waste Management Plan*. The Environmental Support Contractor (ESC) provides environmental management and technical support for CCAFS, ensuring compliance with the 45 SW Operational Plan 19-14 and all applicable regulations.

The JPC has the capability under their own management plan to treat fuel wastes including rinseate on station at FSA-1 or to dispose of them off station. Hazardous waste generated at CCAFS is labeled with a USEPA identification number for the contractor, and is transported, treated, and disposed of under this number. The JPC collects and transports hazardous waste to a hazardous waste accumulation site within the fuel complex, or a licensed disposal facility off station. 40 CFR 262, authorizes the accumulation of waste for up to 90 days without permitting. N_2H_4, monomethyl hydrazine, or nitrogen tetroxide are stored at FSA-1 for less than 90 days, and are then taken off station for disposal.

There are two 90-day accumulation sites at FSA-1, and one each at SLC-41 and SPIF. CCAFS currently operates a single main hazardous waste storage facility at Buildings 44200/44205. The storage facility maintains hazardous wastes for up to 1 year, excluding N_2H_4, monomethyl hydrazine, or nitrogen tetroxide.

3.2.3 Pollution Prevention

Air Force Policy Directive 32-70, *Environmental Quality*, outlines the Air Force policy for pollution prevention. This directive references Air Force Instruction 32-7080, *Pollution Prevention Program*, which defines the Air Force's Pollution Prevention Program requirements. The Pollution Prevention Management Plan establishes the overall strategy, responsibilities, and objectives for reducing pollution of the ground, air, surface water, and groundwater at CCAFS.

3.2.4 Remediation Sites

The Installation Restoration Program (IRP) was established by the Air Force to identify, characterize, and remediate past environmental contamination on DoD installations. The program established a process to evaluate past disposal sites, control the migration of contaminants, and control potential hazards to human health and the environment. There are 147 Solid Waste Management Units (SWMUs) at CCAFS. These SWMUs were identified based on historic practices and the results of a RCRA Facility Action (RFA) completed by the USEPA in 1989. Some of the SWMUs were studies under the IRP, and some did not require further action since a release was not suspected.

The project area includes the use of either SLC-37 or SLC-41. SLC- 37, identified as an IRP site (SWMU 56), contained elevated polychlorinated biphenyls (PCBs) levels in soils. PCB-containing paint used in the past is determined to be the source of contaminated soil at the launch complex. Contaminated soils were removed during an Interim Measure (IM) in 1998 with a cleanup target level of 3.5 mg/kg. Approximately 3,937 tons of soils were removed. Currently, chlorinated solvents in groundwater are being investigated under a RCRA (Resource Conservation and Recovery Act) Facility Investigation (RFI).

PCB contaminated soils were also removed from SLC-41 (SWMU 47) during RFI activities. The removal of PCB contaminated soils to the 2.0 mg/kg cleanup level resulted in soil concentrations protective to ecological habitat. The launch complex is under a land use control implementation plan (LUCIP). Currently, institutional controls are in place to minimize wildlife exposure to residual soil inside the restricted area.

FSA-1 (SWMU 57) had an RFI submitted in January 2000. It determined that the site contained soils and groundwater contaminated by fuels and solvents. Currently, the site is undergoing interim measures consisting of soil excavation and groundwater monitoring.

There is a closed IRP site (SWMU 83) located at Facility 49904A, adjacent to the SAB (FAC 49904), in the industrial area. It was designated as needing no further action (NFA) in 1995. The AB is located across from Hangar E (FAC 1612/SWMU 79) another IRP site. This site was investigated in 1996, results determined a NFA designation was warranted.

3.2.5 Storage Tanks

Storage tanks are subject to Federal regulations and FAC Chapters 62-761. Aboveground petroleum storage tanks must be registered if over 550 gallons in size, and underground petroleum storage tanks are registered if over 110 gallons in size, except those used to store heating fuels. All of the non-petroleum storage tanks are unregulated. There are 10-in-service aboveground storage tanks (ASTs) associated with FSA-1, 18-unmaintained ASTs, and 4-underground storage tanks (USTs). SLC-41 has 11-in-service ASTs and SLC-37 has 1-in-service AST. There are 6 ASTs and 1 UST in the SPIF/SMAB complex.

3.3 HEALTH AND SAFETY

Issues pertaining to health and safety as related to the processing and deployment of the AEHF satellite include fueling and encapsulation of the satellite, transportation, and launch. The primary safety regulation to address these issues at CCAFS is the Eastern and Western Range 127-1, Range Safety Requirements. This Range Safety Requirement addresses all aspects of range safety at CCAFS, and establishes the framework within which safety issues are addressed. This document incorporates other safety documentation by reference, and requires the preparation of activity specific plans and

procedures. Additional important regulations, used for reference only, are Air Force Manual 91-201, "and the Air Force Occupational Health (AFOSH) Standard 91-99.

The City of Cape Canaveral, Kennedy Space Center (KSC), and the range contractor at CCAFS have entered a mutual aid agreement in case of an on-station emergency. At CCAFS, Range Safety monitors launch surveillance areas to ensure the risk to people, aircraft, and surface vessels are within acceptable limits. Control areas and airspace are closed to the public as required. A Notice to Mariners and a Notice to Airmen (NOTAM) are published and circulated in accordance with established procedures to provide warning to personnel (U.S. Air Force, 1998). The Air Force has developed the "Concept to Launch" process for missile programs which includes a safety review procedure (U.S. Air Force, 1998). Safety issues associated with launch activities at CCAFS were evaluated in the EELV FEIS.

Other health and safety considerations involve worker exposure to hazardous materials and wastes associated with the processing, launch and operation of the AEFH satellites. Standards and regulations stated in AFI 48-8 Controlling Exposure to Hazardous Materials and AFI 48-145 Occupational Health Program must be adhered to in order to reduce worker contact and prevent health hazards. In addition, all local, State, and Federal regulations (including EPA and OSHA) regarding safety and health must be adhered to.

3.4 TRANSPORTATION

The Region of Influence (ROI) for transportation potentially affected by the AEHF satellite Proposed Action at CCAFS includes key Federal, State, and local roads within north and central Brevard County. Airport facilities are also described. Local rail networks and port facilities are not affected by the Proposed Action and are not described.

3.4.1 Roadways - Off-installation Network

As CCAFS is located on an Atlantic Ocean barrier island to the east of another barrier island where Kennedy Space Center (KSC) is located, there are only a few roads that access the installation. The northern access is provided by NASA Parkway (State Road (SR) 405), which also traverses the KSC. The southern access is provided by SR 528, which passes to the south of the KSC. On the Florida mainland, a number of other roadways provide access to these two primary links. Both US-1 and I-95 provide access to the area from points north and south of CCAFS. These facilities parallel the entire eastern seaboard of the United States. Orlando lies approximately 81 kilometers (50 miles) to the west on SR-528 (the Martin Anderson Beeline Expressway). The Beeline Expressway was constructed to provide a direct, high-speed link for CCAFS/KSC employees who chose to live in the Orlando urban area.

In addition, SR-A1A, SR-401 and SR-3 also provide important north-south access functions in the area. SR-A1A is a divided highway located on the eastern barrier island immediately adjacent to the Atlantic coast. SR-A1A approaches SR-528 from the south

and is a major transportation corridor for both CCAFS and Patrick AFB employees. SR-401, a primary access route to CCAFS from other areas on the eastern barrier island to the south of CCAFS, becomes General Samuel C. Phillips Parkway as it approaches Gate 1. Persons traveling SR-A1A from the city of Cape Canaveral or points south, as well as those from the Orlando area traveling on SR-528, generally access the base via SR-401. SR-3 provides north-south access along the western barrier island and connects SR-520, SR-528, and SR-405. SR-405 is an east-west arterial that becomes the NASA Causeway upon entering KSC.

Table 3.4-1 describes the traffic conditions for the major roadways in the area. Generally, most of the roadways in the area are operating at an adequate level of service[1]. However, US 1, to the south of SR-528, and sections of I-95 are approaching congestion levels that are determined to be unacceptable for those particular facilities in accordance with the level of service standards set in the Brevard County Comprehensive Plan. Each of these facilities is programmed for major improvements in the near future.

Table 3.4-1 Cape Canaveral Air Force Station Area Roadways

Roadway	**From**	**To**	*** Daily Capacity**	**1998 ADT**	**LOS**
OFF BASE ROADS					
I-95	SR 520	SR 524	46,900	44,000	C
I-95	SR 524	SR 528	46,900	38,500	C
I-95	SR 528	SR 407	32,300	31,500	B
I-95	SR 407	SR 50	32,300	33,000	C
I-95	SR 50	SR 406	46,900	26,500	B
US 1	Forrest	SR 528	35,000	34,222	E
US 1	SR 528	Fay Blvd.	42,800	31,049	C
US 1	Fay Blvd.	SR 405	42,800	25,824	B
US 1	SR 405	SR 50	42,800	25,536	B
SR A1A	North Atlantic	SR 401	35,000	30,772	C
SR 3	SR 520	SR 528	40,000	35,052	D
SR 3	SR 528	KSC	32,800	15,765	B
SR 401	SR 528	CCAFS	35,000	13,463	B
NASA Causeway	US 1	KSC	42,800	15,101	A

[1] Level of service (LOS) is a rating of the operational characteristics of a roadway ranging from LOS A (free flow condition) to LOS F (bumper to bumper congestion).

Table 3.4-1 Cape Canaveral Air Force Station Area Roadways

Roadway	From	To	* Daily Capacity	1998 ADT	LOS
SR 528	SR 407	I-95	32,300	23,759	B
SR 528	I-95	Clearlake Rd.	46,900	18,807	A
SR 528	Clearlake Rd.	US 1	49,200	28,540	B
SR 528	US 1	N. Courtenay	49,200	45,800	C
SR 528	N. Courtenay	SR 401	49,200	31,507	B

* Maximum acceptable volume that the road can carry at its adopted LOS

Source: Brevard County MPO

3.4.2 Roadways - On-installation Network

CCAFS roadways provide access to launch complexes, support facilities, and industrial areas. During peak hours, traffic flow remains steady, and significant delays seldom occur. Central Control Road, a primary arterial, adjoins Phillips Parkway, connecting it with Lighthouse Road. Industry Road, another primary arterial, proceeds westward from the parkway, becoming the NASA Causeway at the KSC boundary. Samuel C. Phillips Parkway is the principal on-site arterial, a divided highway accommodating most of the north-south traffic. At its intersection with Skid Strip Road, it becomes a one-way, northbound arterial, whereas the southbound lanes are an extension of Hangar Road from the north. ICBM Road is the primary access road to many of the launch complexes. Recent traffic information for on-base roads was not available.

3.5 ENVIRONMENTAL JUSTICE

3.5.1 Background

An environmental justice analysis is included in this document to comply with the intent of EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, as well as Air Force guidance. Objectives of the EO 12898 of Federal agency implementation strategies and identification of disproportionately adverse human health or environmental effects on low-income and minority populations potentially impacted by proposed Federal actions. Accompanying EO 12898 was a Presidential Transmittal Memorandum that referenced existing Federal statutes and regulations to be used in conjunction with EO 12898. One of the Federal statutes referenced was NEPA. Specifically, the memorandum indicated that, “Each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 U.S.C. section 4321 et. seq.”

3.5.2 Methodology

Most of the environmental effects from the AEHF satellite program at CCAFS are anticipated to occur in Brevard County. Tables for the 1990 Census of Population and Housing were used to extract data on low-income and minority populations in census tracts in Brevard County. The census reports both on minority and poverty status. Minority populations included in the census are identified as Black; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; Hispanic; or Other. Poverty status (used in this EA to define low-income status) is reported as the number of families with income below poverty level ($12,764 for a family of four in 1989, as reported in the 1990 Census of Population and Housing).

Based upon the 1990 Census of Population and Housing, Brevard County had a population of 398,978. Of that total, 35,815 persons, or 9.13 percent, were low-income, and 49,861 persons, or 12.45 percent, were minority. Forty of the 89 census tracts located in Brevard County have a disproportionate percentage of low-income or minority populations (or both). These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be subject to environmental justice impacts.

3.6 SPACE DEBRIS RE-ENTRY

The expanded use of semi-synchronous and geosynchronous orbits has increased the probability of collisions between satellites at higher altitudes. Since 1977, the special density of objects at geosynchronous altitude has increased by more than two orders of magnitude; from 1.85×10^{-11} to 2.38×10^{-9} objects/km^3. Satellites are made up of four types of objects: payload, rocket bodies, operational debris (objects released intentionally such as ejection springs and lens caps, or those released accidentally such as gloves or tools), and fragmentation debris. Fragmentation occurs by explosion of rocket bodies or collision between objects (rocket bodies, payloads, and/or debris) (U.S. Air Force, 1993).

Orbital debris is a concern because of a combination of fundamental issues. The first is that the volume of space occupied by Earth-orbiting objects is much smaller than that occupied by interplanetary meteoroids; therefore, the risk of collision between payloads and boosters has always been greater than from the collision of meteoroids of the same size. Second, large objects act as a source of smaller objects by fragmenting (U.S. Air Force, 1993).

Almost half of the objects orbiting the Earth have come from vehicle fragmentation. There are at least three causes of fragmentation: propulsion related explosions, intentional explosions (antisatellite tests), and collisions. Historically, the largest uncontrolled addition to orbital debris has been the breakup of upper stages. The dominant cause of these breakups appears to have been pressure-vessel failure due to deflagration of hypergolic propellants, stress failure of the vessels, or the reduction of pressure-vessel integrity by collision with meteoroids or other space objects (U.S. Air Force, 1993). The *EELV Final Environmental Impact Statement*, dated April 1998 (U.S. Air Force Space

and Missile Systems Center) discusses space debris before separation of the launch vehicle.

For the AEHF however, the main environmental concern is re-entering debris. Once the AEHF satellite has been placed in geosynchronous orbit, space debris would be contained. At the end of the mission the satellite would be place in disposal orbit which is usually 300km above the geosynchronous altitude. Requirements are evolving, but the most recent US National Space Policy (September 1996) on orbital debris states that the US will seek to minimize creation of space debris, and that design and operation of systems will minimize or reduce accumulation of space debris consistent with mission requirements and cost effectiveness. As a result, it will no longer be acceptable to jettison unneeded equipment. In most cases, this extraneous equipment would be strapped on to the satellite or otherwise contained.

Other policies on space debris have been developed by the UN Commission on the Peaceful Uses of Outer Space (COPUOS), the European Space Agency (ESA), and the Russian Federation. The Russian Federation policy seeking to reduce debris comes from the Laws on Space, Section I, Article 4, Paragraph 2. The ESA passed a resolution to reduce debris in 1989. COPUOS has signed 3 treaties with potential relevance to orbital debris as part of the Space Law Committee of the International Law Association.

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SECTION 4.0

ENVIRONMENTAL CONSEQUENCES

4.1 AIR QUALITY

4.1.1 Proposed Action

For the Proposed Action, potential sources of pollutant emissions exist at five areas involved in the AEHF satellite processing sequence: the SPIF, SLC-37 or SLC-41, FSA-1, SAB, and DSF. If the AEHF satellites are processed at the SPIF, potential pollutant sources would include two hot water boilers used for dehumidification of the facility and a transportable standby diesel generator used to supply electrical power. Also located at the SPIF are two vapor scrubbers (fuel vapor scrubber and oxidizer vapor scrubber) used to control N_2H_4, MMH, and N_2O_4 vapors generated during satellite fuel/oxidizer transfer operations (U.S. Air Force, 1993). It is anticipated that the AEHF satellite will be processed and fueled at the SPIF.

If the AEHF satellites are processed at the SPIF, stationary source emissions, as noted above, would come from the boilers and the standby diesel generator. The boilers are used on a continuous basis as part of the environmental control in the SPIF. Since the SPIF is a source of air pollutants, FDEP determined that the facility is subject to permitting requirements. FDEP has permitting authority under Section 403, Florida Statues (F.S.) and Chapters 17-4.210 and 17-2.210, FAC. FDEP issued an air construction permit, number AC05-208290, for scrubbers to include emissions of N_2H_4, MMH, and N_2O_4 (U.S. Air Force, 1993). Operation of both hot water boilers are permitted under Florida Department of Environmental Protection (FDEP) Permit #AC05-189675 for continuous operation. Electrical power to the SPIF will be supplied from a commercial source; however, during a power outage, standby power is be provided by the diesel generator. The diesel generator will also be used to supply electrical power during tanking operations if required. Emissions from the boilers and diesel generator will include No_X, SO_2, CO, particulate matter, and VOCs. Pollutant emissions from the generator will be sporadic because of the generator's standby status. An FDEP air operations permit is not required for the standby generator unless use exceeds 400 hours per year. Emissions from these sources are not expected to result in any significant impact to ambient air quality (U.S. Air Force, 1993).

The SPIF is considered the primary facility for the processing and fueling of the AEHF satellite. It was designed to accommodate propellant loading operations involving hypergolic fuels such as N_2H_4 and N_2O_4. Associated with these fueling processes are the control devices (fuel and oxidizer scrubbers) needed to treat N_2H_4 and N_2O_4 vapors

generated during these tanking operations (U.S. Air Force, 1993). The AEHF satellite fueling process is described in Section 2.2.3 of this EA.

N_2H_4 and N_2O_4 are considered air toxics by the FDEP. The State regulates an air toxic through the development of "no threat levels' (NTL), a ground-level ambient concentration as defined by the State in "Florida Air Toxics Working List No Threat Levels" to which a person may be exposed and not experience any detrimental effects. The NTL ambient concentrations were developed as part of a strategy to control toxic emissions to a no-threat level and are, as such, health-based standards (U.S. Air Force, 1993).

If propellant loading for the AEHF satellite occurs at the SPIF, operations could be conducted as long as the conditions in the FDEP permit are not jeopardized. It should be noted that the facility is permitted for a predetermined number of operations and hours of operation. Any future AEHF satellite operations would have to fit within these parameters or the permit must be amended to reflect additional operations. The conditions to be met are:

- Sixteen loadings/unloadings per year and 14 hours per year for the fuel scrubber and 19 hours for the oxidizer scrubber.
- Expected vapor mass flow rates to the scrubbers: 6 pounds per hour for N_2H_4 and 23 pounds per hour for N_2O_4.
- The source must be operated properly and the air pollution control device (scrubber) must be operated properly.

As long as permit operating parameters are adhered to, no significant ambient air quality impacts or exceedances of the FDEP NTL for fuel or oxidizer vapors would be expected for AEHF satellite propellant loading conducted in the SPIF.

It is anticipated that the Air Force would use the payload spin test facility (PSTF) to service PTA units with hypergolic propellants prior to each AEHF satellite operation. Propellant loading operations will involve loading MMH or N_2O_4 in the PTA and subsequent cleanup of propellant transfer equipment. During all phases of PTA operation, (propellant loading and propellant transfer equipment cleanup), MMH and N_2O_4 vapors will be vented to fuel and oxidizer scrubbers. An FDEP permit covers the release of N_2H_4, MMH, and N_2O_4vapors from the scrubbers at the PSTF (U.S. Air Force, 1993). The present permit conditions to be met are:

- Maximum helium (used to move propellants into PTA)/MMH gas flow rate to scrubber is 75 standard cubic feet per minute (scfm). Maximum helium/NO_x gas flow rate to scrubber is 450 scfm.

- Venting from the fuel handling system to the control device can occur over four loading or unloading operations per year and 62 days per year.

- Process rate for MMH and N_2O_4 is 850 gallons per operation each. The release of N_2H_4 from the control device will occur only when dispersion conditions are better than stability class 3 and 4 meters per second wind speed.

As long as permit operating parameters are adhered to, no significant ambient air quality impacts are expected from PTA operations conducted at the PSTF.

Once propellant transfer is completed, the PTA is transported to FSA-1 for propellant unloading (if necessary) and cleanup. During propellant unloading and cleanup, fuel or oxidizer vapors generated are vented to scrubbers similar to the ones used at the PSTF. As long as fuel and oxidizer vapors are captured and vented to the scrubbers, no significant air quality impacts are anticipated.

The project region is in an attainment area and the General Conformity Rule under the Clean Air Act is not applicable.

4.1.2 No Action Alternative

CCAFS accommodates other space launch programs unrelated to the Proposed Action that would continue in use for the foreseeable future. The activities associated with these programs have environmental consequences, which have been included in the baseline environmental conditions. Under the No Action Alternative, prelaunch processing operations for other space launch activities would continue to be performed.

4.1.3 Cumulative Impacts

The AEHF satellite program would use existing prelaunch processing facilities with backup generators and boilers that have already been included in the baseline environmental conditions. Additional volatile organic compound emissions would occur primarily from the use of solvents, coatings, and adhesives during prelaunch processing of each SV. These amounts are small and estimated to total no more than 0.5 tons per year, cumulatively. Each launch is a discrete event and air emissions from launches would be dispersed before the next launch occurred.

4.2 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

4.2.1 Proposed Action

Implementation of the Proposed Action, the development, placement, and operation of the AEHF satellite system, would involve bringing hazardous materials on CCAFS. Under the Proposed Action, hazardous materials associated with the development, placement, and operation of the AEHF satellite system would include propellants, batteries, solvents, and adhesives (See Tables 2.2-1, 2.2-2 and 2.2-3). Also, Xenon (Xe) ion thruster propulsion systems require loading at cold, pressurized temperatures, but no hazards exist since Xe is a naturally occurring, inert gas. These materials would be similar to materials currently used. There would be no change in the procedures used to manage hazardous materials. All hazardous materials brought on station must be reported and managed in accordance with AFI 32-7086.

Processing of the AEHF satellite system would generate hazardous waste including protective clothing and solids from equipment decontamination rinseate. Hazardous waste would be handled according to the guidelines set forth in section 3.6.2.

There is a potential for propellant spills or mishaps during processing, including fueling at the SPIF; transfer to the SLC; and launch operations. Spill prevention and control for satellite processing would comply with the CCAFS Oil and Hazardous Substance Pollution Contingency Plan (Oplan 19-1). As well as, the Hazardous Materials Response Plan 32-3, Volume III B; Emergency Response Action Plan, Volume IV; Waste Petroleum Products and Hazardous Waste Management Plan 1914; and Integrated Solid Waste Management Plan for Patrick AFB and CCAFS. These are meant to ensure proper handling, management, and disposal in accordance with all local, State and Federal regulations. In the event of a diesel spill, this non-hazardous waste would be held on site for less than 90 days and removed by the ETR/NASA Joint Propellants Contractor. Contractors operating on CCAFS are also required to have their own hazardous material and hazardous waste management plans.

The SPIF has parallel sanitary sewer and emergency floor drains. All inlets to one or the other system can be capped as operations require. For example, during operations when N_2H_4 and N_2O_4 are not being handled, the emergency floor drains would be plugged. Any spills that are nonhazardous would be routed to the sanitary sewer. During N_2H_4 and N_2O_4 operations, the sanitary sewer would be plugged. A large spill would flow to the unplugged hazardous waste floor drains. Washdown and spill residue from the emergency floor drains would be routed to a sump. From the sump, the waste would be drummed and removed by the ETR/NASA Joint Propellants Contractor. If a propellant spill were to occur, the ETR/NASA Joint Propellant Contractor would have their own hazardous materials management plan and would respond for cleanup. The waste generated from the cleanup operation would be handled as hazardous waste. It would be managed and disposed of in accordance with all State and Federal regulations by the contractor under the contractor's USEPA identification number, and is transported, treated, and disposed of under this number. All wastes determined to be hazardous are sent off site to a licensed treatment, storage, or disposal facility.

Hazardous waste generated during satellite processing would be managed in accordance with RCRA regulations and with 45 SW Waste Petroleum Products and Hazardous Waste Management Plan 19-14.

IRP sites are located at SLC-37, SLC-41, FSA-1, and adjacent to SAB and AB. These remediation sites would have no impact on the Proposed Action. There are USTs and ASTs associated with FSA-1, SPIF, SLC-37 and SLC-41. Unless there is a spill, which is addressed in the above paragraphs, these tanks would have no impact on the Proposed Action.

4.2.2 No Action Alternative

Under the No Action Alternative, the AEHF satellite system would not occur at CCAFS. Consequently, the baseline conditions described in Section 3.2 would remain unchanged. Therefore, no impacts would occur in hazardous materials and hazardous waste management.

4.2.3 Cumulative Impacts

There are no cumulative impacts associated with hazardous materials and hazardous waste management. As stated in Section 4.2.1, CCAFS has in place management plans to control hazardous wastes and materials that are meant to ensure proper handling, management, and disposal in accordance with all local, State and Federal regulations. Also, contractors operating on station are also required to have their own hazardous material and hazardous waste management plans.

4.3 HEALTH AND SAFETY

4.3.1 Proposed Action

By adhering to the primary safety regulation that address satellite processing and launch activities at CCAFS, the Eastern and Western Range Safety Requirements 127-1; AFI 48-8, Controlling Exposures to Hazardous Materials; AFI 48-145, Occupational Health Program; as well as the safety measures required by the 45th Space Wing and all other local, State and Federal regulations including USEPA and OSHA standards, no adverse health and safety impacts are expected.

4.3.2 No Action Alternative

If the No Action Alternative is selected, the AEHF satellite will not be processed or launched from CCAFS. Other satellite vehicles will continue to be processed at CCAFS. Ground communication operations at Schriever AFB will continue in support of the Milstar constellation. Launch activities associated with the EELV system will occur at SLC-37 and SLC-41, however, the six anticipated AEHF satellite launches will not occur. Therefore, there will be no change to the current status of health and safety related issues at CCAFS.

4.3.3 Cumulative Impacts

The AEHF satellite constellation will consist of six satellites launched from CCAFS over a period of five years. This level of satellite processing and launch represents less than 5 percent of the total processing and launch activity that is expected to occur during this time period (*EELV SEIS, April 2000*). Therefore, no cumulative impact to the health and safety environment of CCAFS in expected to result from implementation of the Proposed Action.

4.4 TRANSPORTATION

4.4.1 Proposed Action

Off-installation Network

As there is no increase in permanent employment at CCAFS associated with the Proposed Action, there would be no permanent increase in traffic that would impact the off-installation transportation system. However, during each of the six launches of the AEHF satellite between 2004 and 2009, approximately 50 employees would be temporarily assigned to CCAFS for a period of up to 30 days to prepare for the launch. These employees would probably stay in area motels and travel to and from the CCAFS on a daily basis. As these employees would probably be staying and working in similar locations, it is anticipated that some of the employees would carpool. Therefore, it is assumed there would be fewer than 50 additional autos on the area roadways during peak hours and no significant impacts are anticipated.

On-installation Network

As the transport of the AEHF satellite would occur during early morning hours, there is no anticipated impact to the on-installation network due to the Proposed Action.

4.4.2 No Action Alternative

Under the No Action Alternative, the proposed development, placement in geosynchronous orbit, and operation of the AEHF satellite system at CCAFS would not occur. Consequently, baseline conditions, as described in Section 3.4 would remain unchanged. Implementation of the No Action Alternative would not change current activities associated with CCAFS; therefore, there would be no impacts to the transportation system.

4.4.3 Cumulative Impacts

Processing, launching, and operating the AEHF satellite system from CCAFS would not result in any changes to current facilities or their uses. Therefore, no impacts to transportation would occur.

4.5 ENVIRONMENTAL JUSTICE

4.5.1 Proposed Action

The majority of the environmental impacts of the Proposed Action would occur within the boundary of the CCAFS and would not have an impact on low-income or minority populations. As the processing and launch of the AEHF satellite would occur only six times between 2004 and 2009, and would not constitute a disproportionate impact to low income or minority populations in Brevard County, there would be no environmental justice impacts associated with the Proposed Action.

4.5.2 No Action Alternative

Under the No Action Alternative, the proposed development, placement in geosynchronous orbit, and operation of the AEHF satellite system at CCAFS would not occur. Consequently, baseline conditions, as described in Section 3.5 would remain unchanged. Implementation of the No Action Alternative would not change current activities associated with CCAFS; therefore, there would be no impacts to environmental justice.

4.5.3 Cumulative Impacts

Processing, launching, and operating the AEHF satellite system from CCAFS would not result in any changes to current facilities or their uses. No changes in ground communications structures or operations from those presently supporting the Milstar program are planned. Therefore, no impacts to environmental justice would occur.

4.6 SPACE DEBRIS REENTRY

4.6.1 Proposed Action

A number of measures can be used to reduce the potential for upper stage breakup: (1) removal from orbit by retrieval or planned re-entry, (2) placing a stage in a "disposal orbit" or just outside geosynchronous orbit, and (3) minimizing the possibility of explosion. Explosions can be caused by physical or chemical explosions of residual propellants. Physical explosions occur by the failure of a pressurized tank. Chemical explosions occur by rapid chemical reactions such as deflagrations and/or detonation of propellants and subsequent failure of the pressure-vessel. The occurrence of explosions can be minimized by making the upper stages inert (i.e., all pressuant gases and stored propellants reduced to a minimum). Orbital debris will be minimized through implementation of Air Force Space Command (AFSPACECOM) Regulation 57-2 (July 1991) requiring analysis, minimization, and mitigation of orbital debris. Reentry of space debris from the launch vehicle is assessed in the *EELV Final Environmental Impact Statement*, dated April 1998 (U.S. Air Force Space and Missile Systems Center). Once the AEHF satellite is placed in orbit, all debris would be contained. Also, at the end of the AEHF satellites' mission, US guidelines require that the satellites be placed in disposal orbit, which is normally 300 km above geosynchronous obit. By following the guidelines set forth for space debris, there would be no significant impacts anticipated.

Some satellite components can and do survive reentry. It is possible that components of the AEHF may survive. However, most objects are melted or vaporized by the tremendous amount of heat generated by the friction between the object and the atmosphere. Risks to individuals for being hit by debris reentering the earth's environment is estimated to be less than 1 in 1 trillion. In the last 40 years more than 1,400 metric tons of material are believed to have survived reentry with no reported casualties. There is a possibility that an AEHF satellite or its components could reenter

the earth's environment; therefore, a potential exists for impacts to the environment. If there were a mishap during launch, there would be an impact from AEHF satellite debris reentry into the earth's environment.

4.6.2 MITIGATION MEASURES

During launch and orbit, the following mitigation measures have been developed to minimize orbiting and deorbiting debris:

Nominal orbit insertion

- All deployment release mechanisms have built in capture elements that minimize debris down to the particulate level, which is below the threshold level for damage.

Abnormal Orbital Insertion

- Comply with Range Safety requirements
- Boost the satellite to a non-interfering orbit using on-board propellant

Nominal End of Life Debris Mitigation Measures (Decommission Status)

- Increasing the orbit at the end of the mission. Fuel would be allocated for orbit boosting to raise satellite approximately 300 kilometers.
- Depressurizing pressure vessels
    - Use of N_2H_4 fuel to depletion
    - Use of Xenon to depletion
    - Keep batteries to minimum internal pressure by draining the batteries of electrical energy.

4.6.3 No Action Alternative

If the No Action Alternative is selected, the AEHF satellite will not be placed in orbit, and will not contribute to the existing volume of debris materials currently in orbit.

4.6.4 Cumulative Impacts

National Aeronautics and Space Administration (NASA) estimates that there are over 9000 objects larger than 10 cm in space. The estimated population of particles between 1 and 10 cm in diameter is greater than 100,000, and the number of smaller particles probably exceeds tens of millions (NASA, 2001). The addition of orbital materials from the AEHF satellite over the planned 5-year deployment period will most likely result in an increase in space debris and could result in an increase in reentry debris (estimated totals for the 6 AEHF satellites, to be added).

4.7 RELATIONSHIP BETWEEN SHORT-TERM USES AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Implementation of the Proposed Action would have a positive effect on long-term productivity by providing the DoD with a secure, survivable communications system (SATCOM) to the US warfighters.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of "…any irreversible and irretrievable commitments of resources that would be involved in the Proposed Action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of non-renewable resources, and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource that cannot be replaced within a reasonable time frame and could have been used for other purposes. Energy and minerals are two examples. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action, such as the disturbance of a cultural site.

For the Proposed Action, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term and temporary, or long lasting, but not significant. The Proposed Action would require fuels to be used by the EELV and surface vehicles for as long as the program continues. Fuel is a non-renewable resource, and would be considered irreversibly lost, as would the costs related to transportation, processing, and operation of the AEHF satellites.

Implementation of the Proposed Action would not result in the destruction of environmental resources. Further, the Proposed Action would not adversely affect the biodiversity of either CCAFS or Schriever AFB. No wildlife habitat or cultural resources at CCAFS or Schriever AFB would be lost or adversely affected as a result of implementation of the Proposed Action. Therefore, there would be no irretrievable commitment of this resource.

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SECTION 5.0

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